DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132 - 5190

N00217.000741
HUNTERS POINT
SSIC NO. 5090.3

5090
Ser 06CH.KF/0955
June 23, 2003

Mr. Gino Yekta
Closure and Technical Services Division
California Integrated Waste Management Board
P.O. Box 4023
Sacramento, CA 95812-4025

Dear Mr. Yekta:

In response to your requests of June 4, 2003 during the conference call our agencies shared, enclosure (1) is presented for your review.

Please review the groundwater level tables, the GMP locations at Crisp Avenue, and other pertinent data from our Hunters Point Shipyard files.

The Navy requests that, after your review and the forwarding of any questions, that the California Integrated Waste Management Board concur with our position that the three tiers of GMPs (barrier system, UCSF compound, and Crisp Avenue) effectively monitor the site and, based on the data the Navy has collected, indicate that no landfill gas has migrated to Parcel A.

If you have any questions, please call me at (619) 532-0913.

Sincerely,

KEITH S. FORMAN
BRAC Environmental Coordinator
By direction of the Commander

Enclosure: 1. Tetratech EMI Letter of June 19, 2003 from Dr. Prilepin, R.G., No. 7305
To Mr. Gino Yekta (CIWMB)

Copy to:
Mr. Chein Kao
Department of Toxic Substances Control
700 Heniz Avenue, Bldg. F, Suite 200
Berkeley, CA 94710

Tetra Tech EM Inc.

135 Main Street, Suite 1800 ◆ San Francisco, CA 94105 ◆ (415) 543-4880 ◆ FAX (415) 543-5480

June 19, 2003

Mr. Gino Yekta
Closure & Technical Services Division
California Integrated Waste Management Board
PO Box 4023
Sacramento, CA 95812-4025

Subject: Historic Groundwater Levels Along Crisp Avenue, Hunters Point Shipyard, San Francisco, California

Dear Mr. Yekta:

This letter serves as a follow-up to the conference call on June 4, 2003, regarding the potential for gas to migrate from the landfill across Crisp Avenue toward Parcel A at Hunters Point Shipyard in San Francisco, California.

Based on available geologic and historic water level data, landfill gas likely would not migrate north of Crisp Avenue because (1) rising serpentinite bedrock acts as an impermeable barrier, preventing gas migration laterally toward Parcel A, and (2) the estimated historic low groundwater level generally coincides with the bottoms of the gas monitoring probes (GMP), at which methane has never been detected.

The attached figures (1 and 2) show the GMP locations along Crisp Avenue and the geologic units at the site. The GMPs are drilled through unconsolidated fill material and Quaternary-age sand and clays to the serpentinite bedrock of the Franciscan Complex. The Franciscan serpentinite is a massive, solid rock mass that is only permeable through fractures. However, the flow of moisture and gas through rock fractures is limited because most of the fractures are filled with residual clay, as observed in the exposed bedrock along Crisp Avenue.

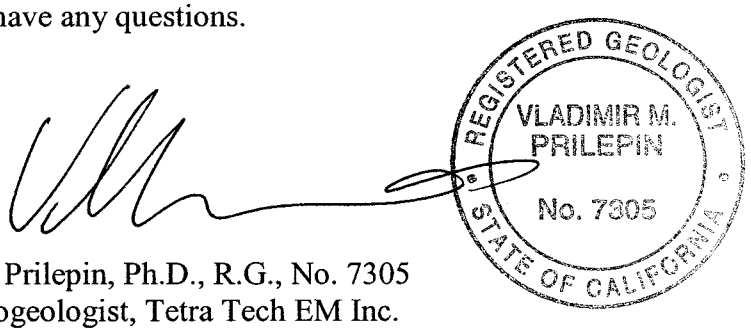
Figure 2 also shows the historic low groundwater level as estimated using measurements collected during installation of the GMPs and groundwater level data collected from nearby monitoring wells and borings. On May 31, 2002, measurements were taken at the GMPs during the onset of the dry season and were adjusted about 2 feet downward based on the observed maximum variation of groundwater levels in monitoring wells near Crisp Avenue.

The water level data compiled between September 1991 and February 2002 from monitoring wells IR01MW03A, IR01MW05A, IR01MW16A, IR72MW33A, IR72MW32A, and IR01MW31A were used to estimate the maximum variation of groundwater levels. These wells are located upgradient from the landfill at distances of less than 200 to 700 feet south from Crisp Avenue (Figure 2). In addition, water level data collected from numerous soil borings adjacent to Crisp Avenue were evaluated. Figure 3 shows the locations of the monitoring wells. Table 1 lists the groundwater elevations and Figures 4 through 7 graphically present the variation in groundwater levels in these wells over time. Attachment A includes the geologic logs for GMPs and monitoring well shown in the cross section along Crisp Avenue (Figure 2). Based on all the available data, the historic low groundwater level shown on the cross section along Crisp Avenue (Figure 2) is unlikely to be lower than shown (that is, the groundwater level would drop significantly below the bottoms of the GMPs).

As stated previously, methane gas has never been detected in any GMP along Crisp Avenue.

The supporting materials are included with this correspondence. Please call me at (415) 222-8249 if you have any questions.

Sincerely,



Vladimir M. Prilepin, Ph.D., R.G., No. 7305
Senior Hydrogeologist, Tetra Tech EM Inc.

Enclosure: (1) Figure 1 – Cross-Section Location Map
(2) Figure 2 – Cross-Section C-C'
(3) Figure 3 – Monitoring Wells Located in the Vicinity of Crisp Avenue
(4) Figure 4 – Groundwater Elevations at IR01MW03A
(5) Figure 5 – Groundwater Elevations at IR01MW05A
(6) Figure 6 – Groundwater Elevations at IR01MW16A
(7) Figure 7 – Groundwater Elevations at IR01MW31A
(8) Table 1 – Groundwater Elevations at Monitoring Wells Near Crisp Avenue
(9) Attachment A – Geologic Logs

Copy to: Keith S Forman, Naval Facilities Engineering Command, Southwest Division
Dave DeMars, Naval Facilities Engineering Command, Southwest Division
Charles R. Mazowiecki, Naval Facilities Engineering Command, Southwest Division
Kevin Bricknell, Tetra Tech EM Inc.
Kathy Vandenhuevel, Tetra Tech EM Inc.

TETRA TECH EM INC.

TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N68711-00-D-0005 Document Control No. TC.A057.10115

TO: Mr. Ron Fuller, Code 02R1.RF
Contracting Officer
Naval Facilities Engineering Command
Southwest Division
1230 Columbia Street, Suite 1100
San Diego, CA 92101-8517

DATE: 6/19/03
DO: 057
LOCATION:
Hunters Point Shipyard, San Francisco, California

FROM: **Michael Wanta,** Contract Manager

DOCUMENT TITLE AND DATE:

Historic Groundwater Levels along Crisp Avenue, June 19, 2003

TYPE: ☐ Contractual Deliverable ☐ Technical Deliverable (DS) ☒ Other (TC)

VERSION: _____ (e.g., Draft, Draft Final, Final) REVISION #: NA

ADMIN RECORD: Yes ☒ No ☐ CATEGORY: Confidential ☐

SCHEDULED DELIVERY DATE: _____ ACTUAL DELIVERY DATE: 6/19/03

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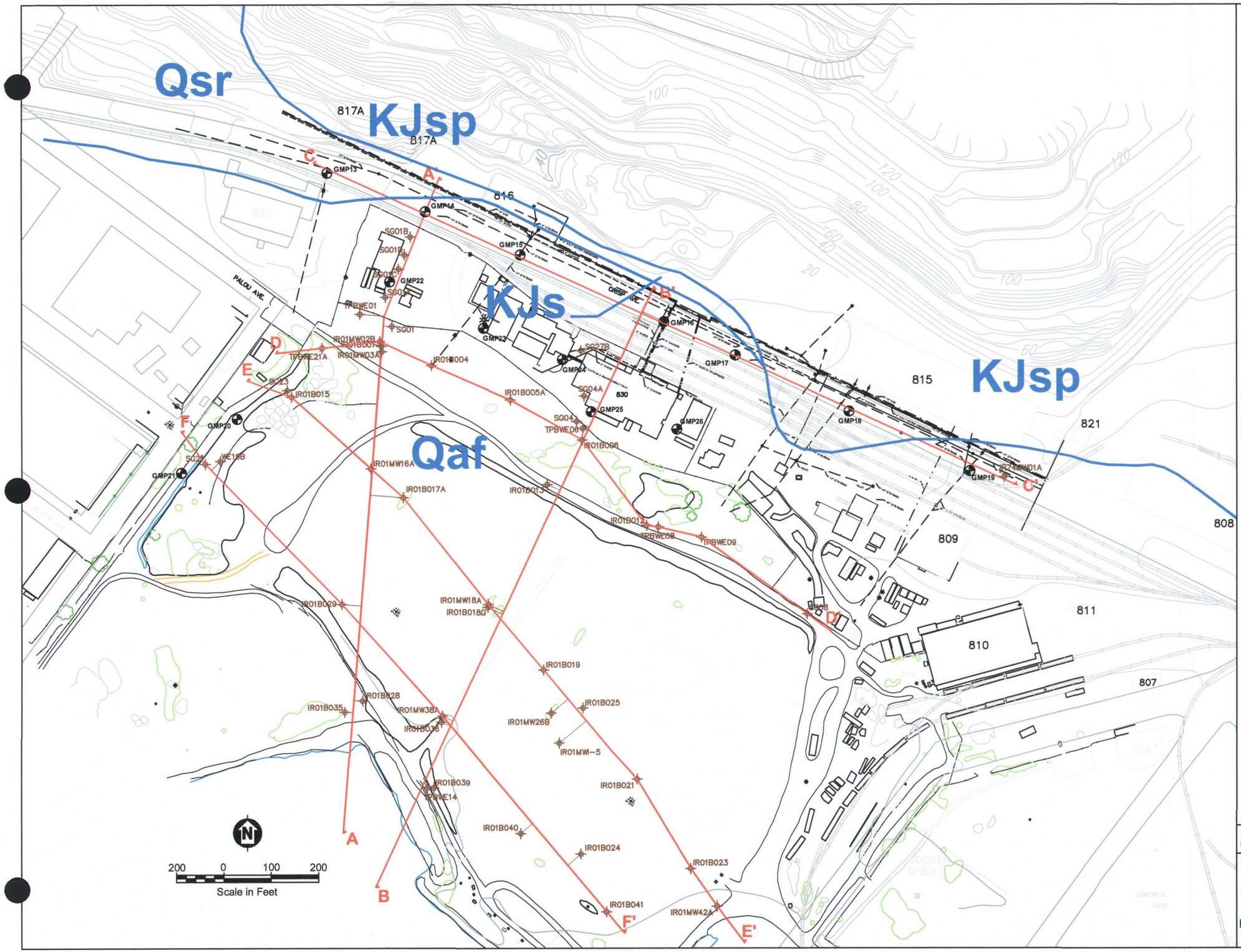
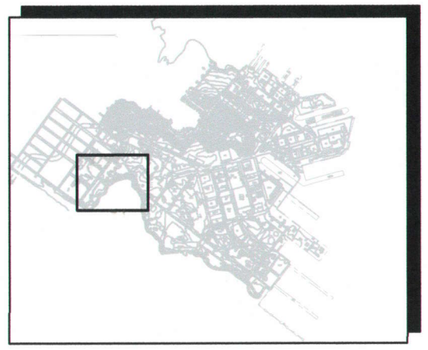




EXPLANATION:

- TPBWE09 — Landfill Extent Test Pit / Landfill Extent Test Boring
- GMP13 — Existing Gas Monitoring Probe
- IR01MW36 — Existing Monitoring Well
- IR01B006 — Existing Boring
- SG02 — Soil Gas Test Location
- Geologic Contact
- Qaf — Artificial Fill
- Qsr — Slope Debris and Ravine Fill
- KJs — Sandstone and Shale Bedrock
- KJsp — Serpentinite Bedrock
- Cross-Section Location
- Gas
- Sanitary Sewer
- Storm Drain
- 255 — Building or Structure

NOTE:
CONTOURS SHOWN ARE FROM AERIAL SURVEY CONDUCTED DURING APRIL 2002.

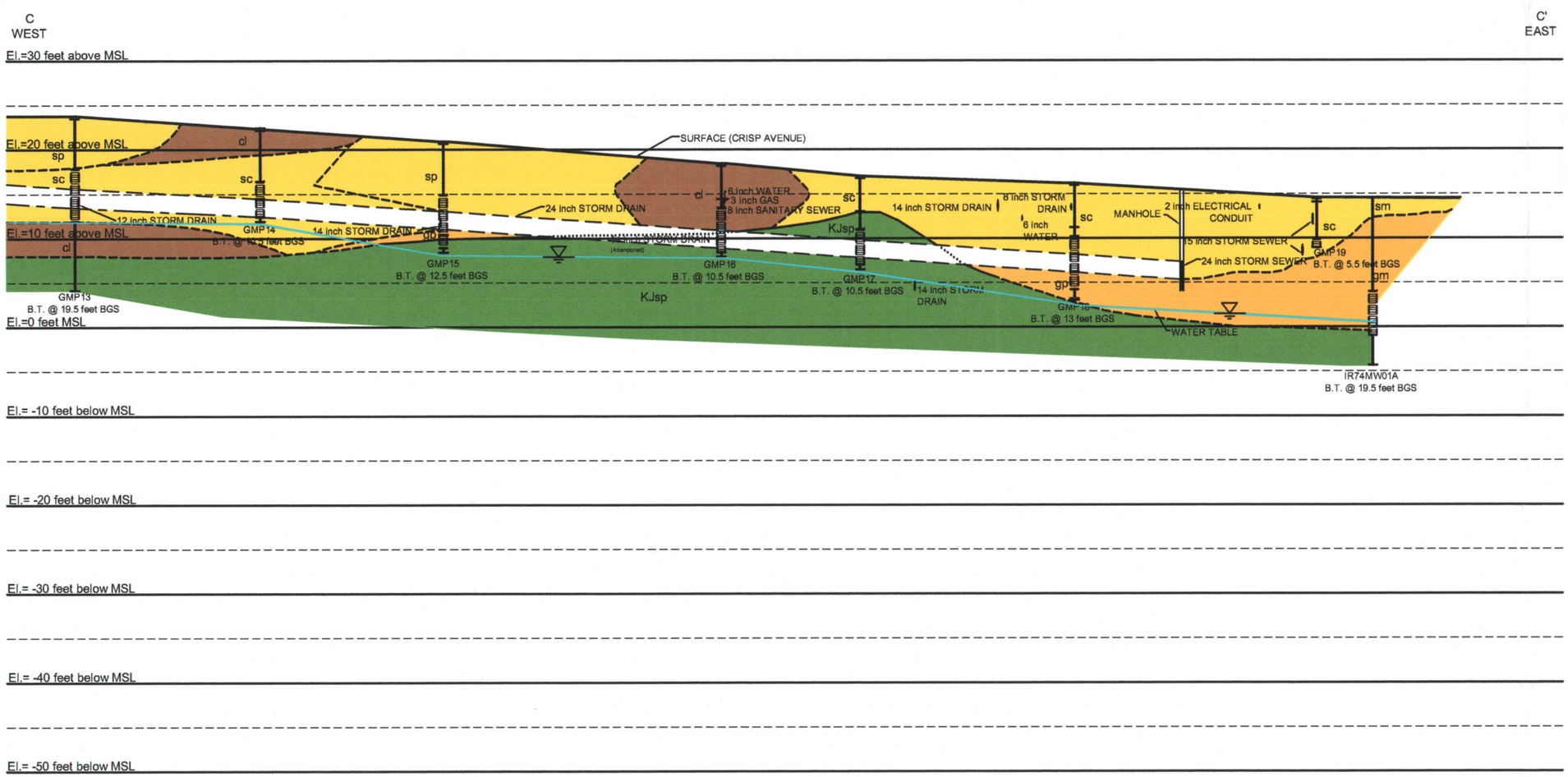
SOURCE FOR GEOLOGY: TETRA TECH. 1998. "DRAFT PARCEL E FEASIBILITY STUDY, HUNTERS POINT SHIPYARD, SAN FRANCISCO, CALIFORNIA." JANUARY 15.

Tetra Tech EM Inc.

Hunters Point Shipyard, San Francisco, California
U.S. Navy Southwest Division, NAVFAC, San Diego, California

FIGURE 1
CROSS-SECTION LOCATION MAP

Historic Groundwater Elevations Along Crisp Avenue



70 0 70 140
Horizontal Scale in Feet

7 0 7 14
Vertical Scale in Feet

LEGEND:

El. = Elevation

GMP = Gas Monitoring Probe

B.T. = Borehole Termination

MSL = Mean Sea Level

BGS = Below Ground Surface

Water table represents the historic low groundwater level based on the measurements at GMPs on May 31, 2002, that were adjusted approximately 2 feet downward to account for the maximum historic level fluctuation.

Stormwater sewer utility line

Screened area

Cap

Sand

Clay

Silt

Gravel

Bay Mud (clay)

Waste

Bedrock

GEOLOGIC DESCRIPTIONS

- cl - Sandy or Silty Clay
- ch - Highly Plastic Clay
- sp - Poorly Graded Sand
- sm - Silty Sand
- sc - Clayey Sand
- sw - Well Graded Sand
- gc - Clayey Gravel
- gw - Well Graded Gravel
- gp - Poorly Graded Gravel
- gm - Silty Gravel
- ml - Silt

Native Soil/Rock:

- Qbm - Bay Mud (clay)
- KJs - Shale Bedrock
- KJsp - Serpentinite Bedrock

NOTE:

Geologic descriptions are based on the Unified Soil Classification System.

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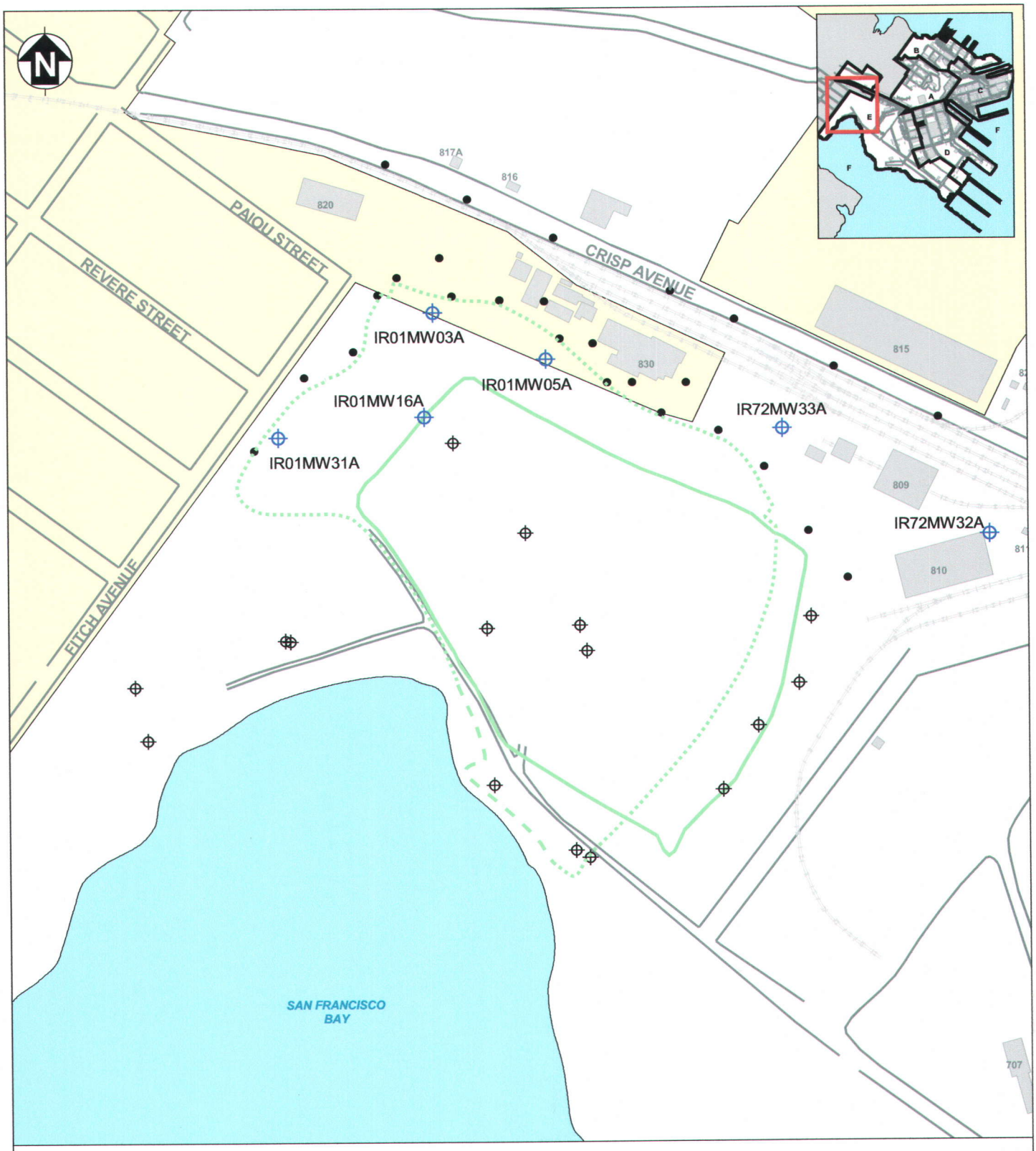
Hunters Point Shipyard, San Francisco, California
U.S. Navy Southwest Division, NAVFAC, San Diego, California

FIGURE 2
CROSS SECTION C-C'

Historic Groundwater Elevations Along Crisp Avenue



- Monitoring Wells Used in Calculations
- Monitoring Well
- GMP Location
- Extent of Landfill
- Approximate Extent of Landfill
- Limit of Landfill Cap
- Buildings
- Rail Line
- Road
- Non-Navy Property

Tetra Tech EM Inc.

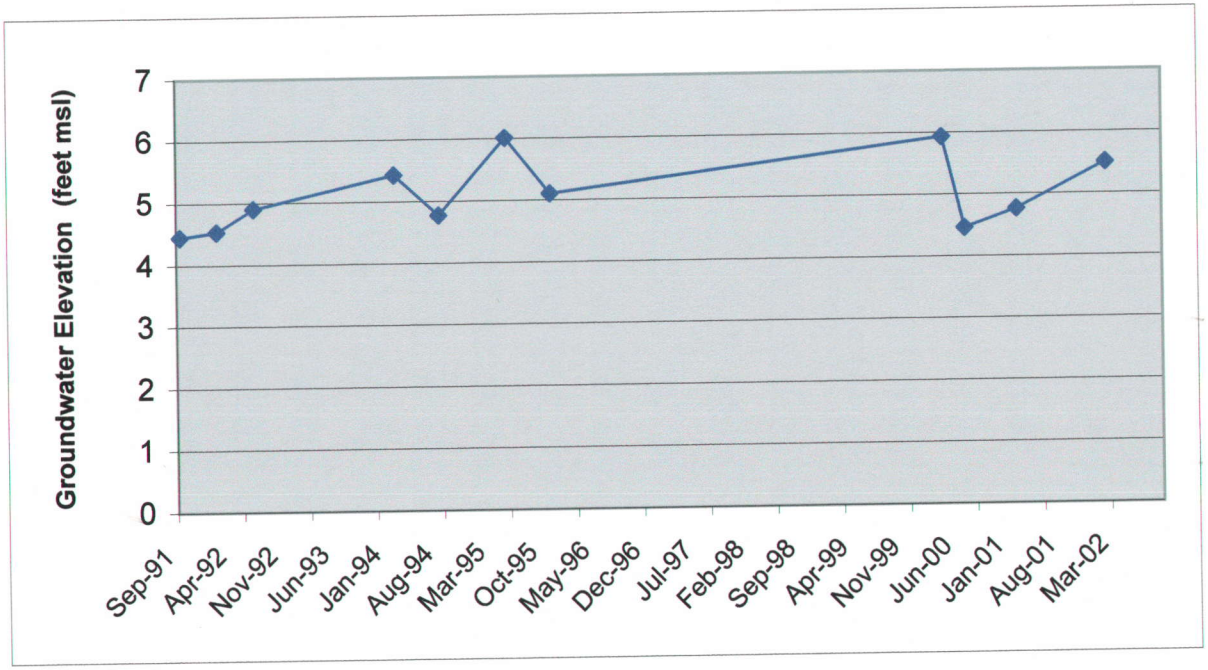
Hunters Point Shipyard, San Francisco, California
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE 3

Monitoring Wells Located in the Vicinity of Crisp Avenue

Historic Groundwater Elevations Along Crisp Avenue

"2003-06-19 g:\hunters point\crisp ave.apr TtEMI-SD KCH



Note:

msl Mean sea level

Tetra Tech EM Inc.

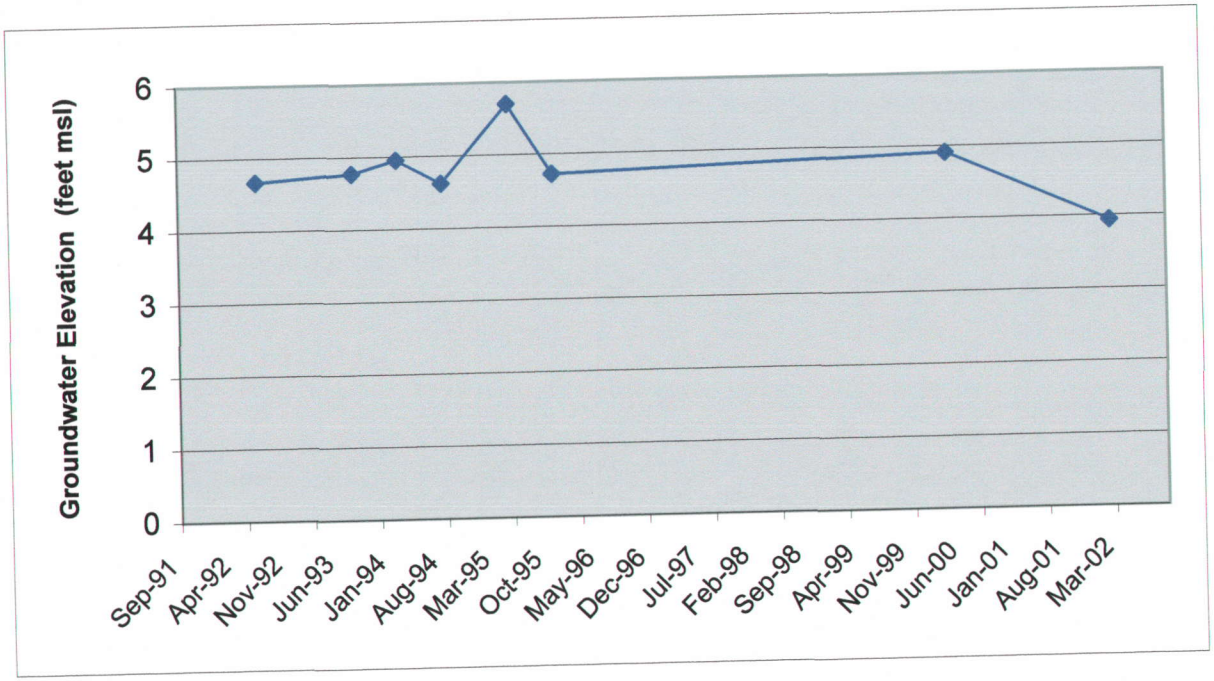
Hunters Point Shipyard, San Francisco, California

U.S. Navy Southwest Division, NAVFAC, San Diego, California

FIGURE 4

Groundwater Elevations at IR01MW03A

Historic Groundwater Elevations Along Crisp Avenue



Note:

msl Mean sea level

Tetra Tech EM Inc.

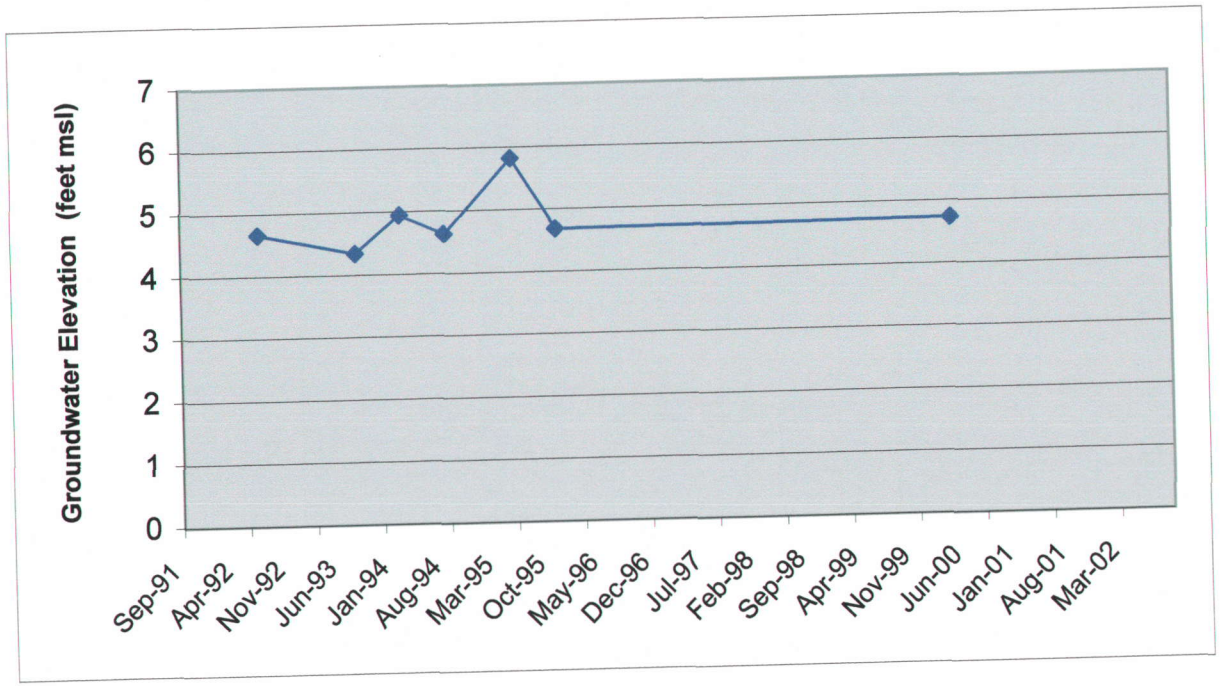
Hunters Point Shipyard, San Francisco, California

U.S. Navy Southwest Division, NAVFAC, San Diego, California

FIGURE 5

Groundwater Elevations at IR01MW05A

Historic Groundwater Elevations Along Crisp Avenue



Note:

msl Mean sea level

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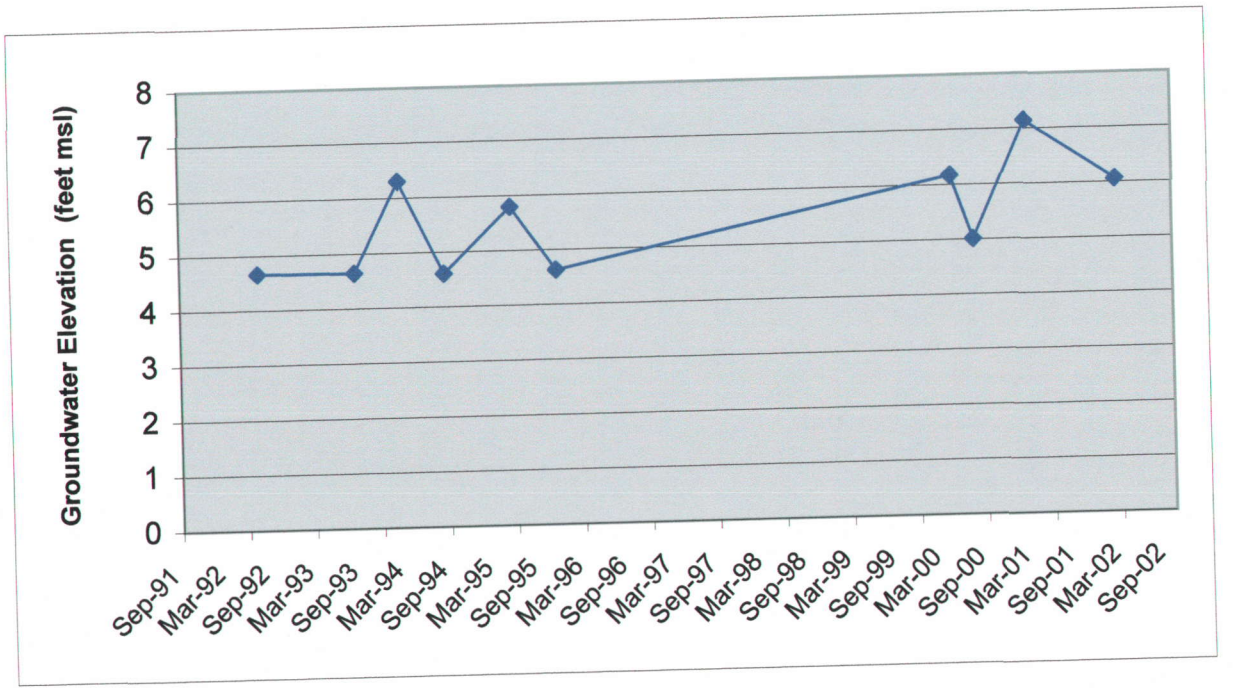
Hunters Point Shipyard, San Francisco, California

U.S. Navy Southwest Division, NAVFAC, San Diego, California

FIGURE 6

Groundwater Elevations at IR01MW16A

Historic Groundwater Elevations Along Crisp Avenue



Note:

msl Mean sea level

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Hunters Point Shipyard, San Francisco, California

U.S. Navy Southwest Division, NAVFAC, San Diego, California

FIGURE 7

Groundwater Elevations at IR01MW31A

Historic Groundwater Elevations Along Crisp Avenue

TABLE 1: GROUNDWATER ELEVATIONS AT MONITORING WELLS NEAR CRISP AVENUE

Historic Groundwater Levels Along Crisp Avenue, Hunters Point Shipyard, San Francisco, California

Well Identification No.	9/3/91	2/7/92	7/13/92	8/16/93	2/18/94	8/12/94	5/22/95	11/2/95	4/10/00	7/12/00	2/14/01	2/20/02
IR01MW03A	4.45	4.53	4.90	5.00	5.43	4.77	6.01	5.10	5.93	4.46	4.76	5.50
IR01MW05A	--	--	4.67	4.77	4.95	4.62	5.70	4.72	4.91	--	--	3.94
IR01MW16A	--	--	4.66	4.34	4.94	4.63	5.82	4.68	4.73	--	--	--
IR72MW33A	--	--	--	--	--	--	--	--	3.34	--	--	3.62
IR72MW32A	--	--	--	--	--	--	--	--	1.97	--	--	--
IR01MW31A	--	--	4.66	4.65	6.30	4.61	5.79	4.63	6.17	5.01	7.14	6.06

Notes:

-- No data are available

ATTACHMENT A

GEOLOGIC LOGS
HISTORICAL GROUNDWATER LEVELS ALONG CRISP AVENUE
HUNTERS POINT SHIPYARD, SAN FRANCISCO, CALIFORNIA

(9 Pages)

LIST OF GEOLOGIC LOGS

GMP13
GMP14
GMP15
GMP16
GMP17
GMP18
GMP19
IR74MW01A

Tetra Tech EM Inc.

Log of Boring: GMP13

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 22.60
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 05/31/02
Completed: 05/31/02
Boring Depth (feet bgs): 19.50
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH EMI
Drilling Company: GREGG

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
								Ground Surface	
0-1		9					sp	3" Asphalt and road base Fill poorly graded SAND with clay and gravel: brown medium to fine grained sand; approximately 10% fine sand with 60% medium gravel moist; gravels are serpentine and chert in content	
1-2		9							
2-3									
3-4		9							
4-5									
5-6		9							
6-7							sc	CLAYEY SAND: 70% fine grained sand, moist; yellowish brown, 30% clay	
7-8		9							
8-9		18							
9-10									
10-11		18							
11-12		18			▽		cl	LEAN CLAY: 90% lean clay 10% sand and occasional gravel; yellowish brown.	
12-13		18							
13-14									
14-15		18							
15-16									
16-17		18					kf	Serpentinite bedrock: slightly weathered, very hard.	
17-18		18							
18-19		18							
19-20								Total depth of boring = 19.5 feet	
20-21									
21-22									
22-23									
23-24									
24-25									
25-26									
26-27									
27-28									
28-29									
29-30									
30-31									
31-32									
32-33									
33-34									
34-35									

Tetra Tech EM Inc.

Log of Boring: GMP14

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 21.70
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 05/31/02
Completed: 05/31/02
Boring Depth (feet bgs): 10.50
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

Logged By: REBECCA LESHER
Drilling Company: GREGG

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
0								Ground Surface	
1		18					CL	3 Inches: Asphalt and Road Base SANDY CLAY with gravel: dark brown; 30% fine sand; 5% gravels	
2		18							
3		6					SC	CLAYEY SAND with gravel: dark brown to black; slightly moist; 60% medium to firm sand; 30% lean clay; 60% gravels serpentine in content; with grain from serpentine	
4									
5		9							
6									
7		0							
8		18			▽				
9									
10		0						Total Depth of Boring = 10.5 feet	
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									

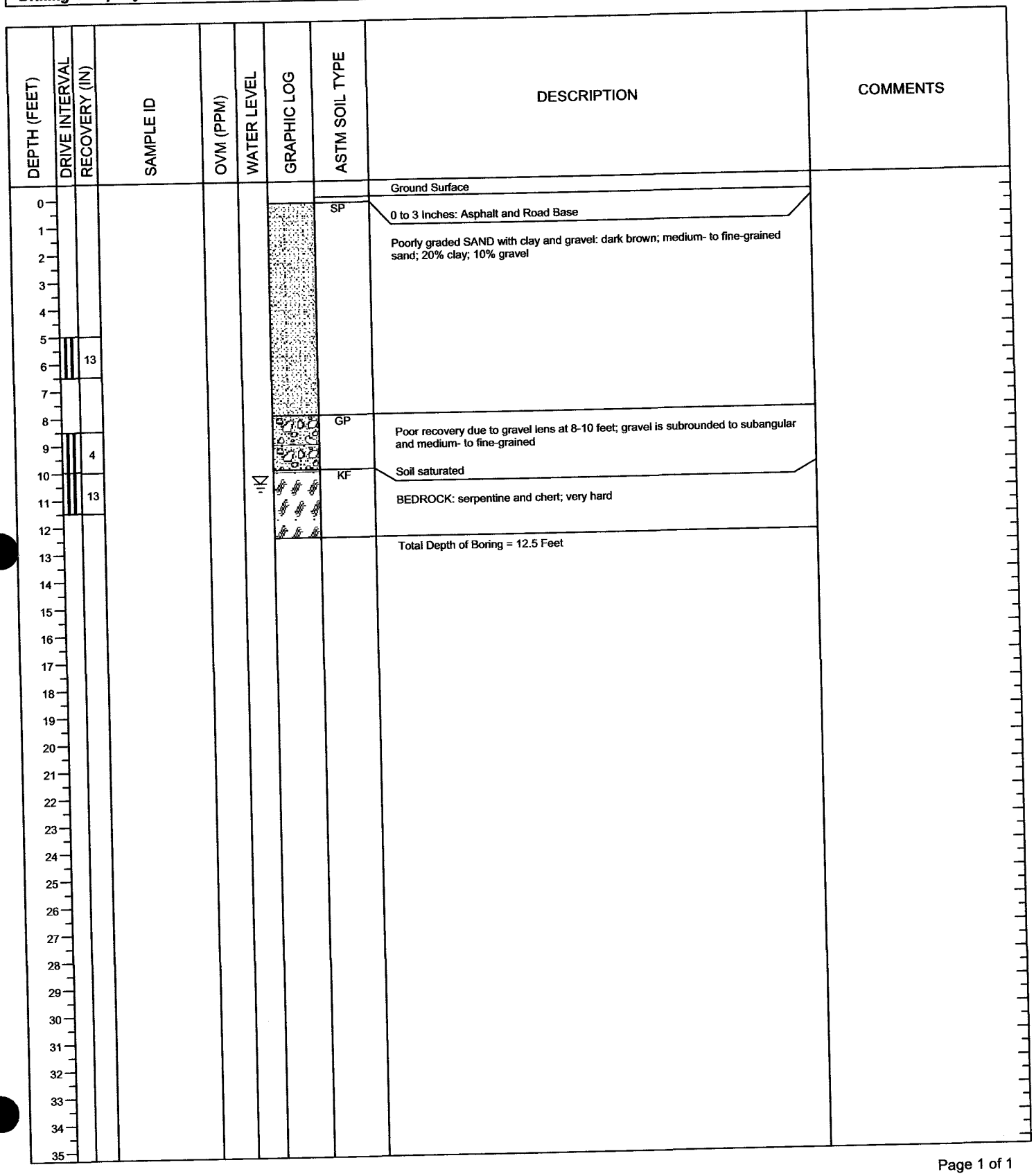
Tetra Tech EM Inc.

Log of Boring: GMP15

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 19.90
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 05/31/02
Completed: 05/31/02
Boring Depth (feet bgs): 12.50
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH EM INC.
Drilling Company: GREGG



Tetra Tech EM Inc.

Log of Boring: GMP16

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH EMI
Drilling Company: GREGG

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 17.50
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 05/31/02
Completed: 05/31/02
Boring Depth (feet bgs): 10.50
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
0								Ground Surface	
0–5							CL	0 to 3 Inches: Asphalt and Road Base SANDY CLAY: dark brown; slightly moist; 20% fine sand	
5–6		18							
8–9		18					Kf	BEDROCK: serpenite and greenstone	
10								Total Depth of Boring = 10.5 Feet	

Tetra Tech EM Inc.

Log of Boring: GMP17

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 16.50
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 05/31/02
Completed: 05/31/02
Boring Depth (feet bgs): 10.50
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH EM INC.
Drilling Company: GREGG

DEPTH (FEET)	DRIVE INTERVAL / RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
0							Ground Surface	
0–3						SC	3 Inches: Asphalt and Road Base CLAYEY SAND: brown; moist; medium to fine sand; 30% lean clay	
4–5						Kf	SERPENTINE BEDROCK: serpenite and greenstone; slightly moist	
5–6	16						Iron oxide staining in bedrock at 8 feet	
7–8	18						Increasing moisture at 9 feet	
9–10	18			⊻				
10							Total Depth of Boring = 10.5 Feet	

Tetra Tech EM Inc.

Log of Boring: GMP18

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 15.10
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 05/31/02
Completed: 05/31/02
Boring Depth (feet bgs): 13.00
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH EM INC.
Drilling Company: GREGG

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
0								Ground Surface	
0							SC	3 Inches: Asphalt and Road Base	
1–4								Fill CLAYEY SAND: brown; slightly moist; fine; 20% lean clay; occasional gravel	
3–5								CLAYEY SAND: brown; slightly moist; medium to fine sand; 20% lean clay	
5							GP	Poorly Graded GRAVEL: slight moist; medium and fine gravels; some angular to subrounded	
6–7		24							
10–11		18							
12–13		18			▽			Possible bedrock at 13 feet	
13								Total Depth of Boring = 13 Feet	

Tetra Tech EM Inc.

Log of Boring: GMP19

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 13.80
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 05/31/02
Completed: 05/31/02
Boring Depth (feet bgs): 5.50
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH EM INC.
Drilling Company: GREGG

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
0								Ground Surface	NOTE: BORING WAS LOGGED FROM CUTTINGS.
							SC	3" Asphalt and Road Base	
1								CLAYEY SAND WITH GRAVEL: medium- to fine-grained sand; 20% clay; 5 to 10% gravel	
2									
3									
4								Hit something hard at 5.5 feet	
5								Total Depth of Boring = 5.5 Feet	
6									
7									
8									
9									
10									
11									
12									
13									
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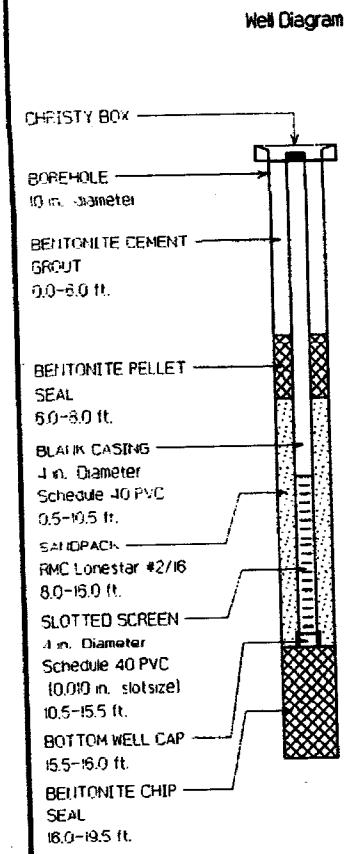
35									

PRC Environmental Management, Inc.

LOG OF BORING IR74MW01A



Blows/6 in.	OVM (ppm)	Sample No.	Depth (ft)	Samples	Symbols	Materials Description
30 13 15	3	9628J363	0			ASPHALT OLIVE SILTY SAND (SM) 5Y4/4, medium dense, dry, 80% fine to medium sand, 15% silt, 5% fine serpentinite gravel, trace yellowish brown (10YR5/8) mottling, fill
6 11 11	3	9628J364	5			OLIVE SILTY GRAVEL WITH SAND (GM) 5Y4/4, medium dense, moist, 65% coarse serpentinite gravel, 20% silt, 15% fine to medium sand, fill
						GRAYISH GREEN POORLY GRADED GRAVEL (GP) 5G5/2, medium dense, moist, 100% highly weathered coarse serpentinite gravel, fill
18 10 12	1	9628J365	10			YELLOWISH RED SILTY GRAVEL WITH SAND (GM) 5YR5/8, medium dense, moist, 65% coarse chert gravel, 20% silt, 15% fine chert sand, f.
30 30 50/3"	1	9628J366	15			OLIVE YELLOW SERPENTINITE BEDROCK (sp) 5Y6/8, dry, moderately to closely fractured, weak, moderately weathered
18 50/3"			20			Bottom of boring at 19.5 feet. Boring backfilled with bentonite chips to 16 feet.
			25			
			30			
			35			
			40			

Project Number CTO 005
Project Name Parcel E RI Report
Project Task Hunters Point Shipyard
Project Location San Francisco, California
Equipment B-61 Hollow Stem Auger Rig, 10 in. diam.

Date Drilled 07/11/96
GS Elevation 13.77 ft.
First Encountered Wet Soil 14 ft.
Total Depth Of Borehole 19.5 ft.

Figure